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SCIENCE

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FRIDAY, JANUARY 12, 1900.

THE CENTURY'S PROGRESS IN APPLIED
MATHEMATICS.*

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I.

THE honor of election to the presidency of the American Mathematical Society carries with it the difficult duty of preparing an address, which may be at once interesting and instructive to a majority of the membership, and which may indicate at the same time the lines along which progress may be expected in one or more branches of our favorite science. In partial recognition of the honor you have conferred upon me it has seemed that I could do no better than to consider with you some of the principal advances that have been made in mathematical science during the past century. But here at the outset one must needs feel sharply restricted by the limitations of his knowledge and by the wide extent of the domain to be surveyed. Especially must this be the case with one who belongs to no school of mathematicians, unless it be the 'old school' of inadequate opportunities and desultory training. On account of these conditions, I have found it essential to accept the ordinary division of the science into pure and applied mathematics and to confine my attention in this address wholly to applied mathematics. Here again, however, it is

MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Professor J. McKeen Cattell, Garrison-on-Hudson, N. Y.

* Address of the President of the American Mathematical Society, read December 28, 1899.

crystals based on the principles of symmetry. It is devoted exclusively to the geometrical relations of crystal forms and to methods of determining these relations and of representing them graphically.

In the first nine chapters the general properties of crystals are described, including very full discussions of symmetry relations and of the properties of zones. The discussion is geometrical rather than analytical and follows more or less closely the treatises of Miller and Story-Maskelyne. In Chapters VI. and VII., treating of crystal drawing and methods of projection, no mention is made of the gnomonic projection, which now occupies an important place in crystallographic discussion.

The treatment of the general optical and physical properties of crystals of the different systems contained in Chapter X. is very brief and seems hardly adequate in a work of this character.

Chapters XI. to XVIII. are devoted to descriptions of the thirty-two classes of crystals. The classification of these types is essentially that of Groth. A feature of this part of the work is the presentation of a great many examples of crystals of various substances in each class, each crystal being worked out in detail with all the logarithmic computations necessary for the determination of its elements and the indices of its forms. Directions for drawing the forms are also not infrequently given after their determination, and a great deal of useful information in practical crystallography may be found scattered through these examples. But their number seems rather more than necessary, adds very much to the bulk of the book and so scatters the desired information as to reduce its usefulness.

In the final chapter on Goniometers but scant justice is done to the theodolite goniometer, no reference being made to the admirable graphic methods of discussing measurements made with it developed by Federow and Goldschmidt.

A complete index concludes the volume. The excellent typography and text figures deserve a word of praise.

The book hardly commends itself to beginners in crystallography, being too elaborate in its treatment and too mathematical in its pres-

entation. Its greatest service will be to more advanced students doing practical work in the study of crystals.

C. PALACHE.

SCIENTIFIC JOURNALS AND ARTICLES.

THE contents of the *American Journal of Science* for January are as follows:

'Products of the Explosion of Acetylene,' by W. G. Mixture.

'Glaciation of Central Idaho,' by G. H. Stone.

'Pogonia Ophioglossoides,' by T. Holm.

'Graftonite, a new Mineral from Grafton, New Hampshire, and its Intergrowth with Triphylite,' by S. L. Penfield.

'Explorations of the *Albatross* in the Pacific Ocean,' by A. Agassiz.

'Analyses of Italian Volcanic Rocks, II.'; by H. S. Washington.

'Constitution of the Ammonium Magnesium Arseniate of Analysis,' by M. Austin.

THE *Astrophysical Journal* for December contains the following articles:

'Robert Wilhelm Bunsen,' by Henry Crew.

'The Wave-Length of the Corona Line,' by C. A. Young.

'Density of Close Double Stars,' by Alexander Roberts.

'The Densities of the Variable Stars of the Algol Type,' by Henry Norris Russell.

'Note on the Spectrum of *P. Cygni*,' by A. B  lopol-sky.

'Apparatus and Method for the Photographic Measurement of the Brightness of Surfaces,' by J. Hartmann.

'The Great Sun-Spot of September, 1898,' by J. F  nyi.

'A Spectroscope of Fixed Deviation,' by Ph. Pellin and Andr   Broca.

'Researches on the Arc-Spectra of the Metals,' by B. Hasselberg.

THE contents of *Appleton's Popular Science Monthly* for January include 'The Advance of Astronomy in the Nineteenth Century,' by Sir Robert Ball, 'The Applications of Explosives,' by Professor C. E. Munroe, 'Scenes on the Planets,' by Mr. Garrett P. Serviss, Professor Ward on 'Naturalism and Agnosticism,' by Mr. Herbert Spencer, and 'Old Rattler and the King Snake,' by President David Starr Jordan. The *Monthly* is somewhat altered in appearance, and the price is \$3.00 per annum. We trust that its influence may be correspondingly increased.

St. Nicholas magazine, which is so popular with young people and has on the whole exercised such an excellent influence, will with the new year add a department of natural history, under the editorship of Mr. Edward F. Bigelow, editor of *Popular Science*. Six pages, monthly, will be devoted to this new department. Two of these will be given up to the out-door world; two more to indoor study and research, both in nature and science; one to correspondence from the children; and one to a department of 'Questions and Answers.'

SOCIETIES AND ACADEMIES.

PHILOSOPHICAL SOCIETY OF WASHINGTON.

THE annual meeting of the Society was held at the Cosmos Club on December 23, 1899. The usual reports of the Secretaries and Treasurer were read and an Amendment to the Constitution proposed at the last annual meeting was adopted. By this action membership in the General Committee is subject to new conditions as far as the ex-Presidents of the Society are concerned.

The election of officers for the coming year resulted as follows:

President: G. M. Sternberg, Surgeon General U. S. A.; *Vice-Presidents*: H. S. Pritchett, Superintendent Coast and Geodetic Survey; C. D. Walcott, Director Geological Survey; L. F. Ward, Geological Survey; Richard Rathbun, Smithsonian Institution; *Secretaries*: J. E. Watkins, National Museum; E. D. Preston, Coast and Geodetic Survey; *General Committee*: Cyrus Adler, Library of Congress; W. A. DeCaindry, War Department; J. H. Gore, Columbia University; G. W. Littlehales, Navy Department; H. M. Paul, Naval Observatory; F. W. True, National Museum; C. K. Wead, Patent Office; I. Winston, Coast and Geodetic Survey; C. F. Marvin, Weather Bureau.

E. D. PRESTON,
Secretary.

SCIENCE CLUB OF THE UNIVERSITY OF WISCONSIN.

THE December meeting of the Science Club of the University of Wisconsin was held on the evening of December 18th, the program of the evening being a paper by Mr. S. M. Babcock, dealing with the fat globules of milk.

Mr. Babcock stated that, although the fat globules of milk were discovered about two hundred years ago, no accurate knowledge of their structure, number or size was gained until quite recently. Two hypotheses have been advanced regarding their structure. One is that they are surrounded by a thin membrane of albuminous matter which prevents their uniting when they come into contact and protects them from the solvent action of ether when this is shaken with milk, unless a little acid or alkali is first added to dissolve the membrane. The other hypothesis holds that the globules are free particles of fat emulsified with the serum. It was shown that all phenomena which have been considered to favor a membrane are such as occur also in artificial emulsions, where no true membrane can exist if the fat globules are as small as those of milk, and it was, therefore, concluded that milk is an emulsion. The method of counting fat globules by means of capillary tubes was described and the circumstances which affect their number and size were discussed with the aid of lantern slides.

WM. H. HOBBS.

THE ACADEMY OF SCIENCE OF ST. LOUIS.

AT the meeting of the Academy of Science of St. Louis of December 18, 1899, Dr. Amand Ravold addressed the Academy on the necessity and means of filtering and otherwise purifying water, especially with reference to freeing it from bacteria, for municipal purposes. The speaker explained the sand-bed filter system as used in Germany and England, and the American mechanical system, represented by two commercial devices. The Wormser filter plate was also described and its characteristics were considered.

WILLIAM TRELEASE,
Recording Secretary.

DISCUSSION AND CORRESPONDENCE.

OBSERVATIONS WITH THE MERIDIAN CIRCLE.

TO THE EDITOR OF SCIENCE: In reading Professor Keeler's most interesting report upon the results of the Lick Observatory, as printed in SCIENCE for November 10, 1899, I find a statement on page 669 which, if not a misprint, eclipses all work of a similar character.